EPA/ACC Technical Workshop for the Voluntary Children's Chemical Evaluation Program

Developing an Exposure Assessment Example for Chemical C

Fredric C. Arnold
USEPA/OPPT

December 12, 2001

Chemical C

- Aromatic hydrocarbon
- Slightly volatile ($H = 10^{-6}$)
- Moderately soluble in water (120 mg/L)
- Moderately rapid biodegradation (15 days)
- Moderate sorption to soil ($K_{ow} = 398$)

Selection of Chemical C

- Reasons for Selection of Chemical C for VCCEP example
  - Potential exposures relevant to children's health
  - High production volume (10^6 lbs/yr)
  - Volume assessed is a substantial fraction of national production
  - Predominant use as an inert in a pesticide formulation for crack & crevice treatment

Example Chemical C

- The objectives of this exposure assessment are:
  - to identify and quantify releases of Chemical C during manufacture, processing and use;
  - to identify populations potentially exposed to Chemical C;
  - to identify and evaluate potential pathways relevant to children's exposure; and

Example Chemical C

- The objectives of this exposure assessment are:
  - To estimate the potential exposure of children to Chemical C using the available use information, exposure data, and any other resources available, such as models.

Life Cycle of Chemical C

Manufactured as a neat chemical substance

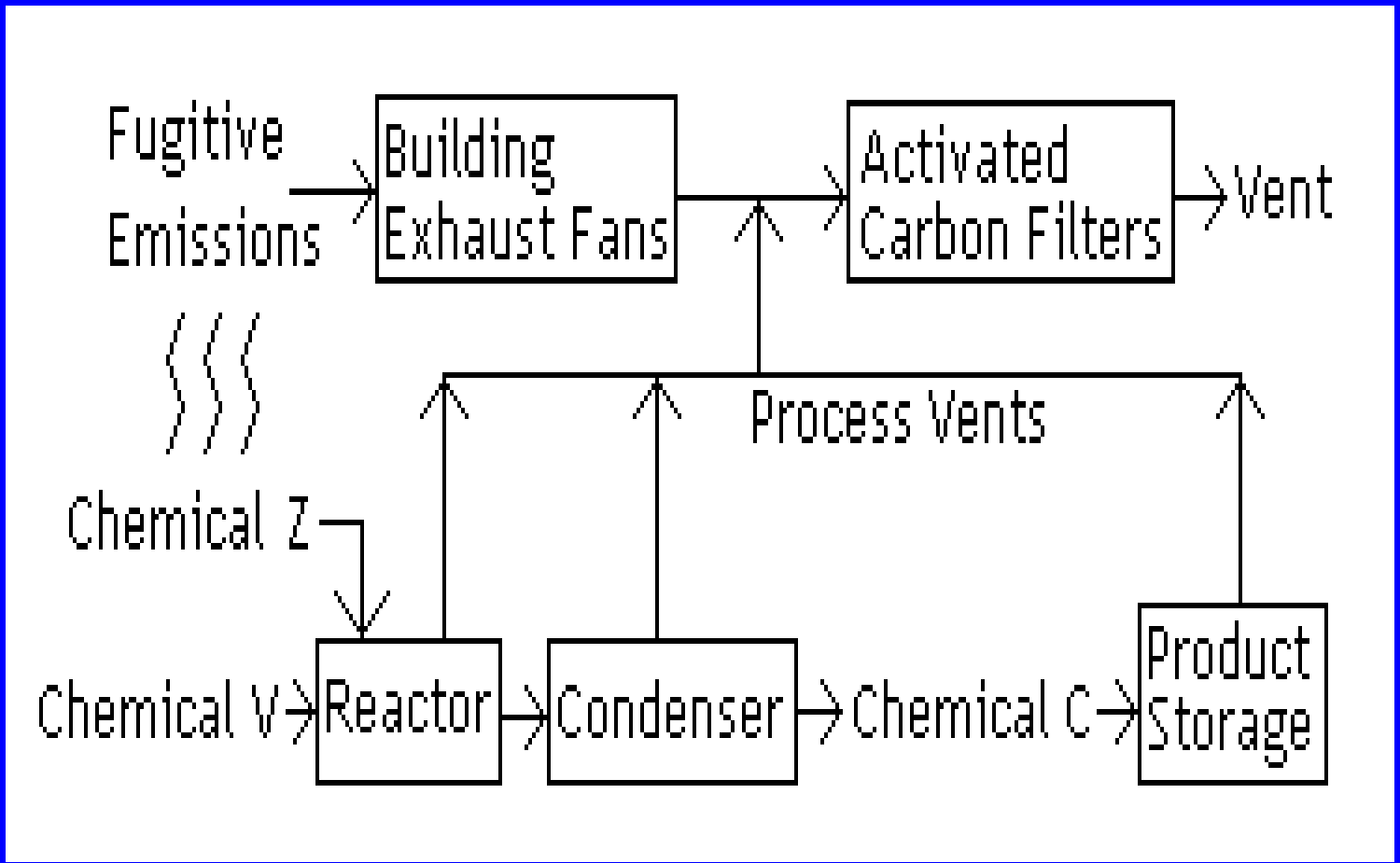
Formulated as an inert ingredient of Pest-X

Applied for crack and crevice treatment

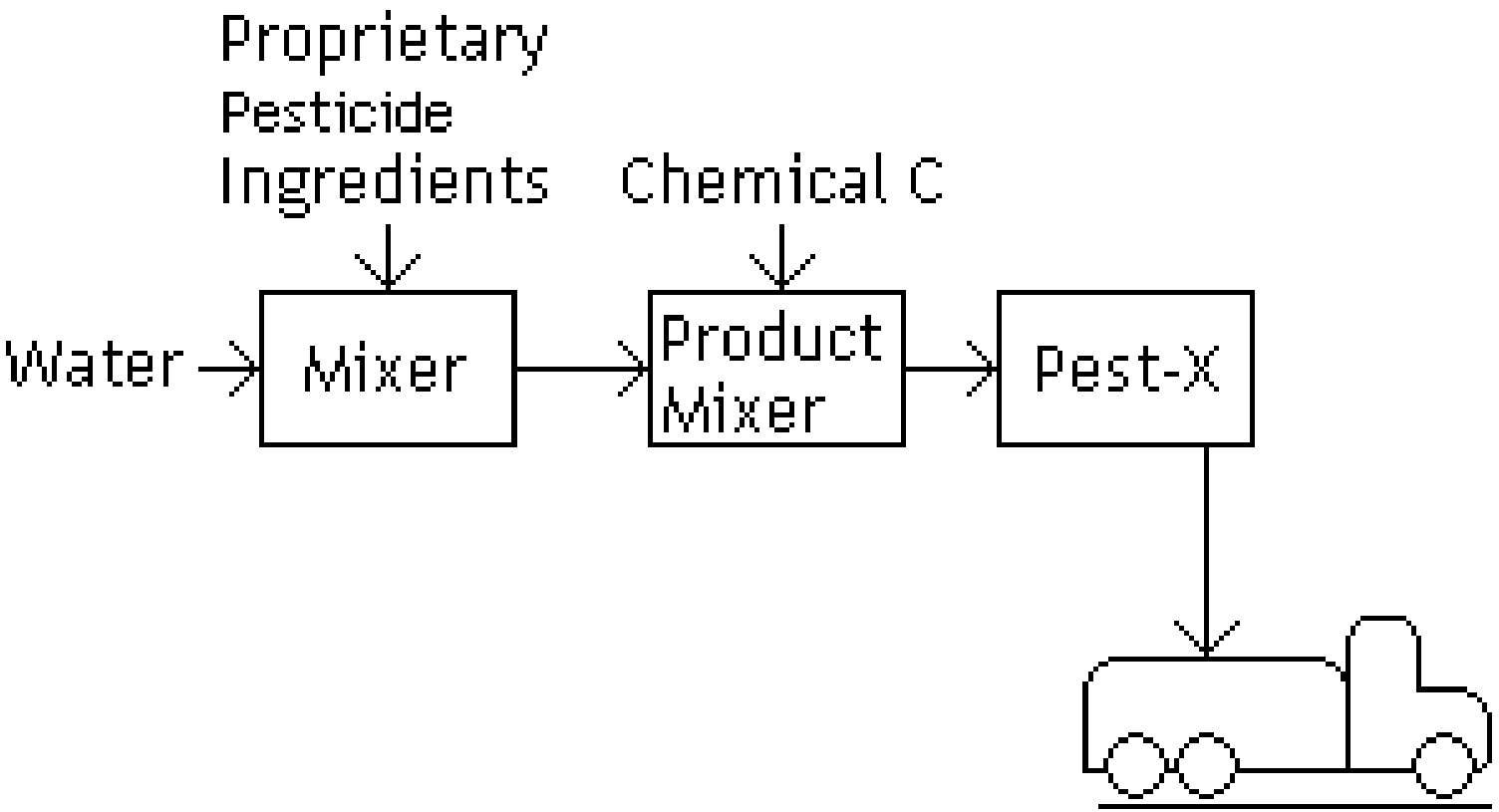
Identifying Potential Releases

- Releases during manufacture, distribution, or processing
- Releases or contact with the chemical during use in industrial, commercial, or consumer products
- Generation from natural sources or human activities

Manufacture of Chemical C



Processing of Chemical C



Potential Releases of Chemical C

- Fugitive releases during manufacture of Chemical C and formulation of Pest-X
- Venting to the surrounding area during manufacture and processing of Chemical C
- Releases from washing or disposal of transport containers
- Releases during application of Pest-X

Information Sources

- Internal study reports prepared by Inert Manufacturers Inc.
- Internal studies by Pesticide Formulators Inc.
- Data found in the scientific literature
- Government, academic, and other public sources

Release Information

- No monitoring data for:
  - air release during manufacturing
  - air release during final formulation
  - surface water release

Release Information

- Data available for:
  - Published emission factors for manufacture of a similar chemical
  - Fugitive air releases during processing of a similar formulation
  - Water releases from cleanup operations during processing of a similar formulation
  - Model estimates of ambient air concentration downwind of the manufacturing facility

Identifying Exposure Pathways

- Occupational exposures during manufacture, processing, and distribution considering the physical properties of the chemical
- Community exposures from releases which migrate through the air, surface water, or ground water
- Use-related exposures where the chemical substance is an ingredient in an industrial, institutional, or commercial product
- Exposure from natural or non-chain-of-commerce sources

Potential Exposure to Chemical C

Uses/Pathways	Affected Populations
• Manufacturing Releases	
– Occupational	– Adults/Nursing Infants
– Community	– All Ages
• Processing Releases	
– Occupational	– Adults
– Community	– All Ages
• Applicator Exposure	
– Dermal	– Adults
– Inhalation	– Adults

Potential Exposure to Chemical C

Uses/Pathways — Affected Populations

- Residential Exposure
  - Surface Contamination
    - Dermal
      - All Ages
    - Hand to Mouth Transfer
      - Infants and Toddlers (1 – 3 years)
  - Inhalation
    - All Ages
- Groundwater
  - Drinking Water Ingestion
    - All Ages

Data Gaps

- Manufacturing
  - Fate of off-site transfer of processing wastes
  - Impact of fugitive emissions on the community
- Processing
  - Impact of fugitive emissions on the community
  - Fate of wastewater from clean-up operations
- Manufacturing & Processing
  - Monitoring data for Chemical C

Identifying Exposed Populations

- Determine the number of workers at a facility
- Determine the population living in the neighborhood of a release from manufacture, processing, or distribution of a chemical substance
- Determine the number of persons using a commercial product or exposed to the residues of a commercial product
- Identify sensitive populations

Routes of Exposure

- Ingestion
  - Dietary
  - Non-dietary [Hand-to-mouth / Pica]
- Inhalation
- Dermal absorption

Populations Potentially Exposed

Population	Number	Route	Age
Infants of Working Mothers	4+	Dietary	<1
Residents Near Manufacturer	4,000	Inhalation	All ages
Formulators	15	Inhalation	Adult
Handlers	10,000	Inhalation/ Dermal	Adult

Populations Potentially Exposed

Population	Number	Route	Age
Post-Application	20,000	Inhalation	All
		Dermal	All
		Non-Dietary Ingestion	Infant (1 – 3)

Can Exposures Co-Occur?

- Yes; Therefore aggregate assessment appropriate:
- Age-group defines exposures:
  - Infants
  - Toddlers
  - Children
  - Adults
    - Handlers of chemical
    - Non-handlers
- Likelihood of Co-occurrence

Next

- Monitoring Data
- Modeling Results